DRINKING WATER SURVEILLANCE PROGRAM

LONDON (LAKE HURON) WATER SUPPLY SYSTEM

ANNUAL REPORT 1990

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EXECUTIVE SUMMARY

DRINKING WATER SURVEILLANCE PROGRAM

LONDON (LAKE HURON) WATER SUPPLY SYSTEM
1990 ANNUAL REPORT

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

The London (Lake Huron) water supply system is a conventional treatment plant which treats water from Lake Huron and is located at Grand Bend. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. Treated water from this plant is pumped to the city of London where it is fluoridated at the Arva reservoir prior to distribution. This plant has a rated capacity of 327.3 x 1000 m^3/day. The London (Lake Huron) water supply system serves a population of approximately 298,200.

Water at the plant, at the Arva reservoir and at one location in the Grand Bend distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall.

Table A is a summary of all results by group.

No known health related guidelines were exceeded.

The London (Lake Huron) water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

TABLE A

DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)

SUMMARY TABLE BY SCAN

A POSITIVE VALUE DENOTES THAT THE RESULT IS GREATER THAN THE STATISTICAL LIMIT OF DETECTION AND IS QUANTIFIABLE
A '.' INDICATES THAT NO SAMPLE WAS TAKEN

	SCAN	SITE RAW TESTS	RAW POSITIVE	RAW %POSITIVE	TREATED TESTS	TREATED POSITIVE	TREATED %POSITIVE	TREATED 2 TESTS	TREATED 2 POSITIVE	TREATED 2 %POSITIVE	SITE 1 TESTS	SITE 1 POSITIVE	SITE 1 %POSITIVE
	BACTERIOLOGICAL	18	10	55	4	2	50	5	0	0	4	0	0
	CHEMISTRY (FLD)	18	18	100	36	36	100	30	28	93	29	29	100
	CHEMISTRY (LAB)	132	108	81	130	92	70	128	93	72	94	78	82
	METALS	144	45	31	144	48	33	144	37	25	115	38	33
	CHLOROAROMATICS	84	0	0	70	0	0	84	0	0	56	0	0
	CHLOROPHENOLS	12	0	0	12	0	0	12	0	0	.	.	.
	PAH	82	0	0	82	0	0	99	0	0	.	.	.
	PESTICIDES & PCB	204	0	0	183	0	0	204	0	0	85	0	0
	PHENOLICS	6	1	16	6	0	0	6	0	0	.	.	.
	SPECIFIC PESTICIDES	50	0	0	49	0	0	50	0	0	4	0	0
	VOLATILES	174	0	0	174	25	14	174	24	13	145	20	13
TOTAL		924	182		890	203		936	182		532	165	

DRINKING WATER SURVEILLANCE PROGRAM

LONDON (LAKE HURON) WATER SUPPLY SYSTEM
1990 ANNUAL REPORT

INTRODUCTION

The Drinking Water Surveillance Program (DWSP) for Ontario is a monitoring program providing immediate, reliable, current information on drinking water quality. The DWSP officially began in April 1986 and is designed to eventually include all municipal supplies in Ontario. In 1990, 76 systems were being monitored.

Appendix A has a full description of the DWSP.

The DWSP was initiated for the London (Lake Huron) water treatment plant in the spring of 1986. Previous annual reports have been published for 1986, 1987, 1988 and 1989.

PLANT DESCRIPTION

The London (Lake Huron) water supply system located at Grand Bend, is a conventional treatment plant which treats water from Lake Huron. The process consists of coagulation, flocculation, sedimentation, filtration and disinfection. Treated water from this plant is pumped to the city of London where it is fluoridated at the Arva reservoir prior to distribution. This plant has a rated capacity of 327.3 x 1000 m^3/day. The London (Lake Huron) water supply system serves a population of approximately 298,200.

The sample day flows ranged from 135.5 x 1000 m^3/day to 166.3 x 1,000 m^3/day.

General plant information is presented in Table 1 and a schematic of plant processes, chemical addition points and sampling locations in Figure 1.

SAMPLING AND ANALYSES

Sample lines in the plant were flushed prior to sampling to ensure that the water obtained was indicative of its origin and not residual water standing in the sample line.

At all distribution system locations two types of samples were obtained, a standing and a free flow. The standing sample consisted of water that had been in the household plumbing and service connection for a minimum of six hours. These samples were used to make an assessment of the change in the levels of inorganic

compounds and metals, due to leaching from, or deposition on, the plumbing system. The only analyses carried out on the standing samples therefore, were General Chemistry and Metals. The free flow sample represented fresh water from the distribution main, since the sample tap was flushed for five minutes prior to sampling.

Attempts were made to capture the same block of water at each sampling point by taking the retention time into consideration. Retention time was calculated by dividing the volume of water between two sampling points by sample day flow. For example, if it was determined that retention time within the plant was five hours, then there would be a five hour interval between the raw and treated sampling. Similarly, if it was estimated that it took approximately one day for the water to travel from the plant to the distribution system site, this site would be sampled one day after the treated water from the plant.

Stringent DWSP sampling protocols were followed to ensure that all samples were taken in a uniform manner (see Appendix B).

Plant operating personnel routinely analyze parameters for process control (Table 2).

Water at the plant, at the Arva reservoir in London and at one location in the Grand Bend distribution system was sampled for the presence of approximately 180 parameters. Parameters were divided into the following groups: bacteriological, inorganic and physical (laboratory chemistry, field chemistry and metals), and organic (chloroaromatics, chlorophenols, pesticides and PCB, phenolics, polyaromatic hydrocarbons, specific pesticides and volatiles). Samples were analyzed for specific pesticides and chlorophenols twice a year in the spring and fall. Laboratory analyses were conducted at the Ministry of the Environment facilities in Rexdale, Ontario.

RESULTS

Field measurements were recorded on the day of sampling and were entered onto the DWSP database as submitted by plant personnel.

Table 3 contains information on delay time between raw and treated water sampling, flow rate, and treatment chemical dosages.

Table 4 is a summary break-down of the number of water samples analyzed by parameter and by water type. The number of times that a positive or trace result was detected is also reported.

Positive denotes that the result is greater than the statistical limit of detection established by the Ministry of the Environment laboratory staff and is quantifiable. Trace (<T) denotes that the level measured is greater than the lowest value detectable by the

method but lies so close to the detection limit that it cannot be confidently quantified.

Table 5 presents the results for parameters detected on at least one occasion.

Table 6 lists all parameters analyzed in the DWSP.

Associated guidelines and detection limits are also supplied on Tables 5 and 6. Parameters are listed alphabetically within each scan.

DISCUSSION

GENERAL

Water quality was judged by comparison with the Ontario Drinking Water Objectives publication (ODWOs). When an Ontario Drinking Water Objective (ODWO) was not available, guidelines/limits from other agencies were used. These guidelines were obtained from the Parameter Listing System database.

IN THIS REPORT, DISCUSSION IS LIMITED TO:

- **THE TREATED AND DISTRIBUTED WATER;**
- **ONLY THOSE PARAMETERS WITH CONCENTRATIONS ABOVE GUIDELINE VALUES; AND**
- **POSITIVE ORGANIC PARAMETERS DETECTED.**

BACTERIOLOGICAL

Guidelines for bacteriological sampling and testing of a supply are developed to maintain a proper supervision of its bacteriological quality. Routine monitoring programs usually require that multiple samples be collected in a given system. Full interpretation of bacteriological quality cannot be made on the basis of single samples.

Standard plate count was the only bacteriological analysis conducted on the treated and distributed water. No results were above the guideline.

INORGANIC & PHYSICAL

CHEMISTRY (FIELD)

It is desirable that the temperature of drinking water be less than 15°C. The palatability of water is enhanced by its coolness. A temperature below 15°C will tend to reduce the growth of nuisance organisms and hence minimize associated taste, colour, odour and corrosion problems. The temperature of the delivered water may increase in the distribution system due to the warming effect of the soil in late summer and fall and/or as a result of higher temperatures in the source water.

Field temperature exceeded the ODWO Maximum Desirable Concentration of 15°C in 4 of 16 treated and distributed water samples with a maximum reported value of 23.0°C.

CHEMISTRY (LAB)

The ODWOs indicate that a hardness level of between 80 and 100 mg/L as calcium carbonate for domestic waters provides an acceptable balance between corrosion and encrustation. Water supplies with a hardness greater than 200 mg/L are considered poor and would possess a tendency to form scale deposits and result in excessive soap consumption.

Hardness exceeded the ODWO Aesthetic or Recommended Operational Guideline of 80-100 mg/L in 17 of 17 treated and distributed water samples with a maximum reported value of 122.0 mg/L.

Turbidity in water is caused by the presence of suspended matter such as clay, silt, colloidal particles, plankton and other microscopic organisms. The most important potential health effect of turbidity is its interference with disinfection in the treatment plant and the maintenance of a chlorine residual. The ODWOs Maximum Acceptable Concentration for turbidity is 1.0 Formazin Turbidity Units (FTU).

The laboratory turbidity exceeded the Maximum Acceptable Concentration in two treated water samples leaving the plant. In January the reported value was 2.4 FTU. After investigation by plant personnel, it was determined that the elevated turbidity was due to repairs made to the service water pump, prior to DWSP sampling. This sample also contained positive volatile organic compounds found in the gasket material used during the maintenance. The 1.2 FTU December turbidity value could not be confirmed by the corresponding field turbidity result; a more reliable test.

METALS

At present, there is no evidence that aluminum is physiologically harmful and no health limit for drinking water has been specified. The measure of aluminum in treated water is important to indicate the efficiency of the treatment process. The ODWOs indicate that a useful guideline is to maintain a residual below 100 ug/L as aluminum in the water leaving the plant, to avoid problems in the distribution system.

Aluminum exceeded the ODWO Aesthetic or Recommended Operational Guideline of 100 ug/L in 4 of 17 treated and distributed water samples with a maximum reported value of 820.0 ug/L. The elevated aluminum value occurred in the July Arva reservoir sample which also contained a high turbidity result. At the time of sampling, there was a peak demand on the system and reservoir water levels were extremely low, which may account for the elevated level of aluminum.

ORGANIC

CHLOROAROMATICS

The results of the chloroaromatic scan showed that none were detected.

CHLOROPHENOLS

The results of the chlorophenol scan showed that none were detected.

POLYAROMATIC HYDROCARBONS (PAH)

The results of the PAH scan showed that none were detected.

PESTICIDES & PCB

The results of the PCB scan showed that none were detected.

The results of the regular pesticide scan showed that none were detected above trace levels.

PHENOLICS

Phenolic compounds are present in the aquatic environment as a result of natural and/or industrial processes. The ODWOs recommend, as an operational guideline, that phenolic substances in drinking water not exceed 2.0 ug/L. This limit has been set primarily to prevent undesirable taste and odours, particularly in chlorinated water. No results were detected above trace levels.

SPECIFIC PESTICIDES

The results of the specific pesticides scan showed that none were detected.

VOLATILES

Toluene was found at positive levels in 1 of the 17 treated and distributed water samples analyzed. The maximum observed level was 2.7 ug/L. This was below the ODWO Aesthetic Objective of 24 ug/L. This sample was taken after maintenance of the service water pump during which a gasket material containing solvents was used.

The detection of benzene, ethylbenzene, toluene and xylenes at low, trace levels may be a laboratory artifact derived from the analytical methodology.

THMs are produced during the water treatment process and will always occur in chlorinated waters. THMs are comprised of chloroform, chlorodibromomethane and dichlorobromomethane; bromoform occurs occasionally. Results are reported for the individual compounds as well as for total THMs. Only total THMs results are discussed.

Total THMs were found at positive levels in the 17 treated and distributed water samples analyzed with a maximum level of 38.7 ug/L. This was below the ODWO Maximum Acceptable Concentration of 350 ug/L.

CONCLUSIONS

The London (Lake Huron) water treatment plant, for the sample year 1990, produced good quality water and this was maintained in the distribution system.

No known health related guidelines were exceeded.

FIGURE 1

LAKE HURON WATER SUPPLY SYSTEM

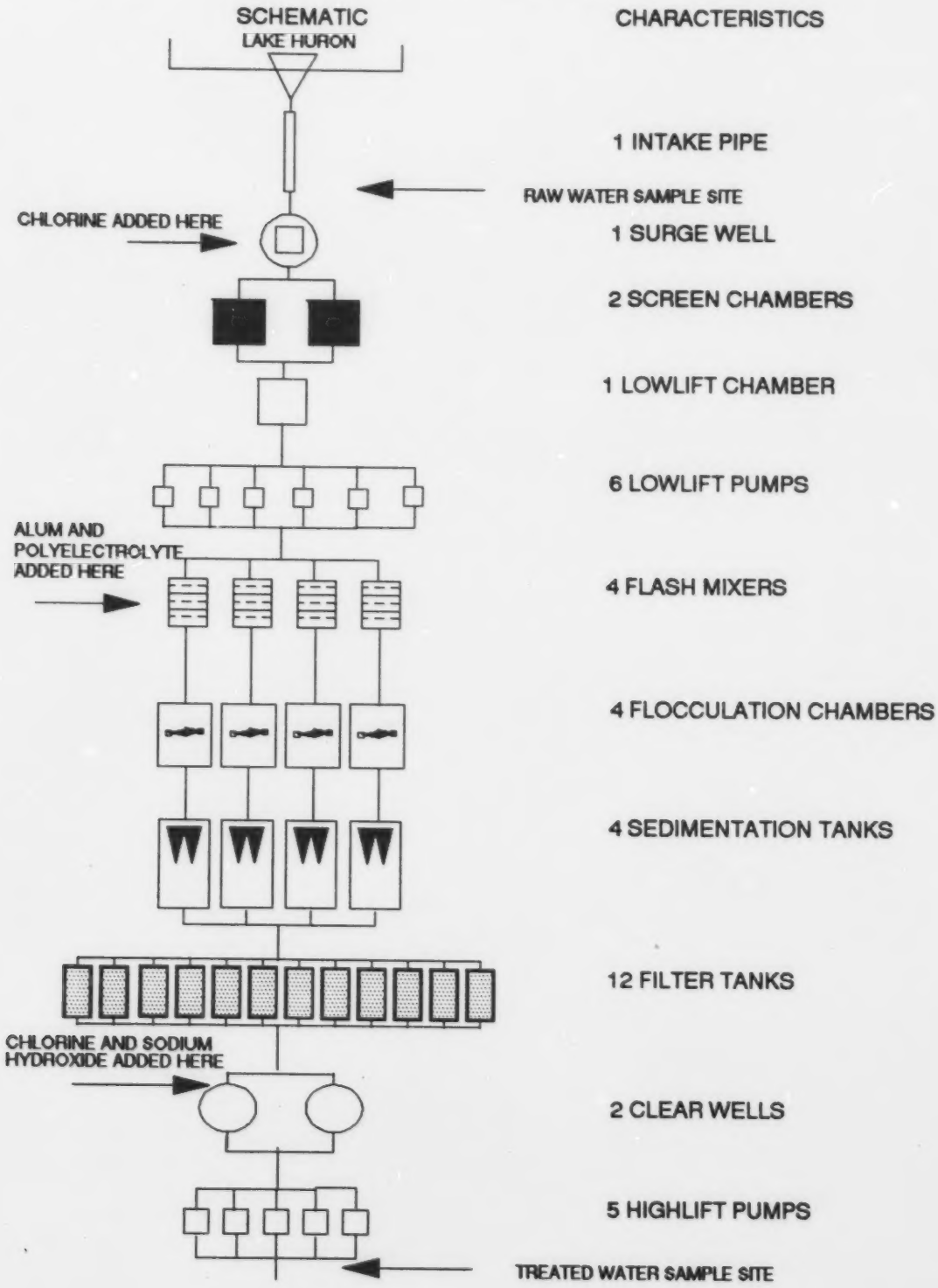

TABLE 1

DRINKING WATER SURVEILLANCE PROGRAM

PLANT GENERAL REPORT

WORKS #: 210000791
PLANT NAME: LONDON (LAKE HURON WSS)

DISTRICT: SARNIA
REGION: SOUTHWEST
DISTRICT OFFICER :J. MANUEL

UTM #: 174359204797200

PLANT SUPERINTENDENT: AL SCOTT

ADDRESS: P.O.BOX 40
GRAND BEND, ONTARIO
N0M 1T0
(519 238 8466)

MUNICIPALITY: STEPHEN TOWNSHIP
AUTHORITY: PROVINCIAL

PLANT INFORMATION

PLANT VOLUME:	25.127	(X 1000 M3)
DESIGN CAPACITY:	345.502	(X 1000 M3/DAY)
RATED CAPACITY:	327.272	(X 1000 M3/DAY)

MUNICIPALITY	POPULATION
AILSA CRAIG	900
ILDERTON	600
LONDON	285,700
PARKHILL	1,575
TWP LONDON	800
TWP MCGILLVARY	1,972
TWP STEPHEN	5,686
TWP WEST WILLIAMS	1,000

TABLE 2
DRINKING WATER SURVEILLANCE PROGRAM
IN-PLANT MONITORING

PARAMETER	LOCATION	FREQUENCY
ALGEA	TREATED WATER IN LAB	WEEKLY
ALUMINUM	TREATED WATER IN LAB	DAILY
TOTAL CHLORINE RESIDUAL	TREATED WATER IN LAB	EVERY 4 HOURS
PH	TREATED WATER IN LAB	EVERY 4 HOURS
	RAW WATER IN LAB	EVERY 4 HOURS
TEMPERATURE	TREATED WATER IN LAB	CONTINUOUS
	RAW WATER	CONTINUOUS
TURBIDITY	AFTER FILTERS	CONTINUOUS
	RAW WATER	EVERY 4 HOURS
	TREATED WATER	CONTINUOUS

TABLE 3

DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) SAMPLE DAY CONDITIONS FOR 1990

			TREATMENT CHEMICAL DOSAGES (MG/L)				
			PRE CHLORINATION	POST CHLORINATION	COAGULATION		FLUORIDATION
			CHLORINE	CHLORINE	ALUM LIQUID	HYDROFLUOSILICIC ACI	HYDROFLUOSILICIC ACI
DATE	DELAY * TIME(HRS)	FLOW (1000M3)					
JAN 15	4.12	146.250	.51	.79	19.80		1.06
MAR 19	4.45	135.540	.41	.90	16.85		1.01
MAY 23	3.63	166.300	.70	1.07	10.00	1.03	
JUL 16	3.96	152.310	.47	.95	15.55	1.07	
SEP 17	3.65	164.980	.63	1.00	24.68		.99
NOV 19	3.63	165.830	.36	.77	16.05		

* THE DELAY TIME BETWEEN THE RAW AND TREATED WATER SAMPLING, SHOULD ESTIMATE THE RETENTION TIME.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			TREATED 2			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
BACTERIOLOGICAL												
FECAL COLIFORM MF	6	2	0	.	.	.	.	.	.	.	.	.
STANDRD PLATE CNT MF	.	.	.	4	2	0	5	0	0	4	0	0
TOTAL COLIFORM MF	6	2	0	.	.	.	.	.	.	.	.	.
T COLIFORM BCKGRD MF	6	6	0	.	.	.	.	.	.	.	.	.
*TOTAL GROUP BACTERIOLOGICAL	18	10	0	4	2	0	5	0	0	4	0	0
CHEMISTRY (FLD)												
FLD CHLORINE (COMB)	.	.	.	6	6	0	6	4	0	5	5	0
FLD CHLORINE FREE	.	.	.	6	6	0	6	6	0	5	5	0
FLD CHLORINE (TOTAL)	.	.	.	6	6	0	6	6	0	5	5	0
FLD PH	6	6	0	6	6	0	6	6	0	5	5	0
FLD TEMPERATURE	6	6	0	6	6	0	6	6	0	4	4	0
FLD TURBIDITY	6	6	0	6	6	0	.	.	.	5	5	0
*TOTAL SCAN CHEMISTRY (FLD)	18	18	0	36	36	0	30	28	0	29	29	0
CHEMISTRY (LAB)												
ALKALINITY	6	6	0	6	6	0	6	6	0	5	5	0
CALCIUM	6	6	0	6	6	0	6	6	0	5	5	0
CYANIDE	6	0	0	5	0	1	6	0	0	.	.	.
CHLORIDE	6	6	0	6	6	0	6	6	0	5	5	0
COLOUR	6	1	4	6	0	5	6	0	4	5	1	2
CONDUCTIVITY	6	6	0	6	6	0	6	6	0	5	5	0
DISS ORG CARBON	6	6	0	6	6	0	6	6	0	5	5	0
FLUORIDE	6	6	0	6	6	0	6	6	0	5	5	0
HARDNESS	6	6	0	6	6	0	6	6	0	5	5	0
IONCAL	6	6	0	6	6	0	6	6	0	5	5	0
LANGELIERS INDEX	6	6	0	5	5	0	2	2	0	4	4	0
MAGNESIUM	6	6	0	6	6	0	6	6	0	5	5	0
SODIUM	6	6	0	6	6	0	6	6	0	5	5	0
AMMONIUM TOTAL	6	2	1	6	0	1	6	1	1	5	0	2
NITRITE	6	3	2	6	1	1	6	0	5	5	0	3
TOTAL NITRATES	6	6	0	6	6	0	6	6	0	5	5	0
NITROGEN TOT KJELD	6	6	0	6	3	3	6	3	3	5	3	2
PH	6	6	0	6	6	0	6	6	0	5	5	0
PHOSPHORUS FIL REACT	6	2	2	6	0	3	6	3	2	.	.	.
PHOSPHORUS TOTAL	6	4	2	6	0	2	6	1	5	.	.	.
SULPHATE	6	6	0	6	6	0	6	6	0	5	5	0
TURBIDITY	6	6	0	6	5	1	6	5	1	5	5	0
*TOTAL SCAN CHEMISTRY (LAB)	132	108	11	130	92	17	128	93	21	94	78	9

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			TREATED 2			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
METALS												
SILVER	6	0	0	6	0	0	6	0	0	5	0	0
ALUMINUM	6	6	0	6	6	0	6	6	0	5	5	0
ARSENIC	6	0	5	6	0	5	6	1	5	5	0	5
BARIUM	6	6	0	6	6	0	6	6	0	5	5	0
BORON	6	4	2	6	4	2	6	2	4	5	3	2
BERYLLIUM	6	0	1	6	0	0	6	0	0	5	0	0
CADMIUM	6	0	0	6	0	0	6	0	1	5	0	0
COBALT	6	0	5	6	0	5	6	0	5	5	0	5
CHROMIUM	6	0	5	6	0	6	6	0	6	5	0	5
COPPER	6	0	6	6	0	6	6	0	6	5	1	4
IRON	6	3	3	6	0	1	6	0	1	5	1	0
MERCURY	6	0	0	6	0	1	6	0	2	.	.	.
MANGANESE	6	6	0	6	6	0	6	4	2	5	4	1
MOLYBDENUM	6	0	6	6	3	3	6	3	3	5	4	1
NICKEL	6	0	4	6	3	3	6	0	4	5	0	2
LEAD	6	1	5	6	2	3	6	0	2	5	1	4
ANTIMONY	6	0	6	6	0	6	6	2	4	5	1	4
SELENIUM	6	0	0	6	0	1	6	0	2	5	0	2
STRONTIUM	6	6	0	6	6	0	6	6	0	5	5	0
TITANIUM	6	5	1	6	1	5	6	1	5	5	1	4
THALLIUM	6	0	0	6	0	0	6	0	0	5	0	0
URANIUM	6	0	6	6	0	5	6	0	6	5	0	5
VANADIUM	6	2	4	6	5	1	6	5	1	5	5	0
ZINC	6	6	0	6	6	0	6	1	5	5	2	3
*TOTAL SCAN METALS	144	45	59	144	48	53	144	37	64	115	38	47
*TOTAL GROUP INORGANIC & PHYSICAL	294	171	70	310	176	70	302	158	85	238	145	56
CHLOROAROMATICS												
HEXACHLOROBUTADIENE	6	0	0	5	0	0	6	0	0	4	0	0
123 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
1234 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
1235 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
124 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
1245 T-CHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
135 TRICHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
HCB	6	0	0	5	0	0	6	0	0	4	0	0
HEXACHLOROETHANE	6	0	0	5	0	0	6	0	0	4	0	0
OCTACHLOROSTYRENE	6	0	0	5	0	0	6	0	0	4	0	0
PENTACHLOROBENZENE	6	0	0	5	0	0	6	0	0	4	0	0
236 TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	4	0	0
245 TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	4	0	0
26A TRICHLOROTOLUENE	6	0	0	5	0	0	6	0	0	4	0	0
*TOTAL SCAN CHLOROAROMATICS	84	0	0	70	0	0	84	0	0	56	0	0
CHLOROPHENOLS												

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			TREATED 2			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
234 TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
2345 T-CHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
2356 T-CHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
245-TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
246-TRICHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
PENTACHLOROPHENOL	2	0	0	2	0	0	2	0	0	.	.	.
*TOTAL SCAN CHLOROPHENOLS	12	0	0	12	0	0	12	0	0	0	0	0
PAH												
PHENANTHRENE	5	0	0	5	0	0	6	0	0	.	.	.
ANTHRACENE	4	0	0	4	0	0	5	0	0	.	.	.
FLUORANTHENE	5	0	0	5	0	0	6	0	0	.	.	.
PYRENE	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(A)ANTHRACENE	5	0	0	5	0	0	6	0	0	.	.	.
CHRYSENE	5	0	0	5	0	0	6	0	0	.	.	.
DIMETH. BENZ(A)ANTHR	3	0	0	3	0	0	4	0	0	.	.	.
BENZO(E) PYRENE	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(B) FLUORANTHEN	5	0	0	5	0	0	6	0	0	.	.	.
PERYLENE	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(K) FLUORANTHEN	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(A) PYRENE	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(G,H,I) PERYLEN	5	0	0	5	0	0	6	0	0	.	.	.
DIBENZO(A,H) ANTHRAC	5	0	0	5	0	0	6	0	0	.	.	.
INDENO(1,2,3-C,D) PY	5	0	0	5	0	0	6	0	0	.	.	.
BENZO(B) CHRYSENE	5	0	0	5	0	0	6	0	0	.	.	.
CORONENE	5	0	0	5	0	0	6	0	0	.	.	.
*TOTAL SCAN PAH	82	0	0	82	0	0	99	0	0	0	0	0
PESTICIDES & PCB												
ALDRIN	6	0	0	5	0	0	6	0	0	4	0	0
ALPHA BHC	6	0	3	5	0	3	6	0	4	4	0	2
BETA BHC	6	0	0	5	0	0	6	0	0	4	0	0
LINDANE	6	0	0	5	0	1	6	0	0	4	0	0
ALPHA CHLORDANE	6	0	0	5	0	0	6	0	0	4	0	0
GAMMA CHLORDANE	6	0	0	5	0	0	6	0	0	4	0	0
DIELDRIN	6	0	0	5	0	0	6	0	0	4	0	0
METHOXYCHLOR	6	0	0	5	0	0	6	0	0	4	0	0
ENDOSULFAN 1	6	0	0	5	0	0	6	0	0	4	0	0
ENDOSULFAN II	6	0	0	5	0	0	6	0	0	4	0	0
ENDRIN	6	0	0	5	0	0	6	0	0	4	0	0
ENDOSULFAN SULPHATE	6	0	0	5	0	0	6	0	0	4	0	0
HEPTACHLOR EPOXIDE	6	0	0	5	0	0	6	0	0	4	0	0
HEPTACHLOR	6	0	0	5	0	0	6	0	0	4	0	0
MIREX	6	0	0	5	0	0	6	0	0	4	0	0
OXYCHLORDANE	6	0	0	5	0	0	6	0	0	4	0	0
OPODT	6	0	0	5	0	0	6	0	0	4	0	0
PCB	6	0	0	5	0	0	6	0	0	4	0	0
DDD	6	0	0	5	0	0	6	0	0	4	0	0
PPDDE	6	0	0	5	0	0	6	0	0	4	0	0

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			TREATED 2			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
PPDDT	6	0	0	5	0	0	6	0	0	4	0	0
AMETRINE	6	0	0	6	0	0	6	0	0	.	.	.
ATRAZINE	6	0	1	6	0	1	6	0	1	.	.	.
ATRATONE	6	0	0	6	0	0	6	0	0	.	.	.
CYANAZINE (BLADEX)	6	0	0	6	0	0	6	0	0	.	.	.
DESETHYLATRAZINE	6	0	0	6	0	0	6	0	0	.	.	.
D-ETHYL SIMAZINE	5	0	0	5	0	0	5	0	0	.	.	.
PROMETONE	6	0	0	6	0	0	6	0	0	.	.	.
PROPAZINE	6	0	0	6	0	0	6	0	0	.	.	.
PROMETRYNE	6	0	0	6	0	0	6	0	0	.	.	.
METRIBUZIN (SENCOR)	6	0	0	6	0	0	6	0	0	.	.	.
SIMAZINE	6	0	0	6	0	0	6	0	0	.	.	.
ALACHLOR (LASSO)	6	0	0	6	0	0	6	0	0	.	.	.
METOLACHLOR	6	0	0	6	0	0	6	0	0	.	.	.
HEXACLCYCLOPENTADIEN	1	0	0	1	0	1	1	0	0	1	0	0
*TOTAL SCAN PESTICIDES & PCB	204	0	4	183	0	6	204	0	5	85	0	2
PHENOLICS												
PHENOLICS	6	1	1	6	0	1	6	0	2	.	.	.
*TOTAL SCAN PHENOLICS	6	1	1	6	0	1	6	0	2	0	0	0
SPECIFIC PESTICIDES												
TOXAPHENE	6	0	0	5	0	0	6	0	0	4	0	0
2,4,5-T	2	0	0	2	0	0	2	0	0	.	.	.
2,4-D	2	0	0	2	0	0	2	0	0	.	.	.
2,4-DB	2	0	0	2	0	0	2	0	0	.	.	.
2,4 D PROPIONIC ACID	2	0	0	2	0	0	2	0	0	.	.	.
DICAMBA	2	0	0	2	0	0	2	0	0	.	.	.
PICHLORAM	0	0	0	0	0	0	0	0	0	.	.	.
SILVEX	2	0	0	2	0	0	2	0	0	.	.	.
DIAZINON	2	0	0	2	0	0	2	0	0	.	.	.
DICHLOROVOS	2	0	0	2	0	0	2	0	0	.	.	.
CHLORPYRIFOS	2	0	0	2	0	0	2	0	0	.	.	.
ETHION	2	0	0	2	0	0	2	0	0	.	.	.
AZINPHOS-METHYL	0	0	0	0	0	0	0	0	0	.	.	.
MALATHION	2	0	0	2	0	0	2	0	0	.	.	.
MEVINPHOS	2	0	0	2	0	0	2	0	0	.	.	.
METHYL PARATHION	2	0	0	2	0	0	2	0	0	.	.	.
METHYLTRITHION	2	0	0	2	0	0	2	0	0	.	.	.
PARATHION	2	0	0	2	0	0	2	0	0	.	.	.
PHORATE	2	0	0	2	0	0	2	0	0	.	.	.
RELDAN	2	0	0	2	0	0	2	0	0	.	.	.
RONNEL	2	0	0	2	0	0	2	0	0	.	.	.
AMINOCARB	0	0	0	0	0	0	0	0	0	.	.	.
BENONYL	0	0	0	0	0	0	0	0	0	.	.	.
BUX	0	0	0	0	0	0	0	0	0	.	.	.
CARBOFURAN	1	0	0	1	0	0	1	0	0	.	.	.
CICP	1	0	0	1	0	0	1	0	0	.	.	.
DIALLATE	1	0	0	1	0	0	1	0	0	.	.	.

TABLE 4
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS)
SUMMARY TABLE OF RESULTS (1990)

SCAN PARAMETER	RAW			TREATED			TREATED 2			SITE 1		
	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE	TOTAL	POSITIVE	TRACE
EPTAM	1	0	0	1	0	0	1	0	0	.	.	.
IPC	1	0	0	1	0	0	1	0	0	.	.	.
PROPOXUR	1	0	0	1	0	0	1	0	0	.	.	.
CARBARYL	1	0	0	1	0	0	1	0	0	.	.	.
BUTYLATE	1	0	0	1	0	0	1	0	0	.	.	.
*TOTAL SCAN SPECIFIC PESTICIDES	50	0	0	49	0	0	50	0	0	4	0	0
VOLATILES												
BENZENE	6	0	2	6	0	1	6	0	2	5	0	0
TOLUENE	6	0	0	6	1	1	6	0	1	5	0	0
ETHYLBENZENE	6	0	3	6	0	1	6	0	2	5	0	1
P-XYLENE	6	0	0	6	0	0	6	0	0	5	0	0
M-XYLENE	6	0	0	6	0	1	6	0	0	5	0	0
O-XYLENE	6	0	0	6	0	1	6	0	0	5	0	0
STYRENE	6	0	4	6	0	0	6	0	0	5	0	0
1,1 DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	5	0	0
METHYLENE CHLORIDE	6	0	0	6	0	0	6	0	0	5	0	0
T1,2DICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	5	0	0
1,1 DICHLOROETHANE	6	0	0	6	0	0	6	0	0	5	0	0
CHLOROFORM	6	0	1	6	6	0	6	6	0	5	5	0
111, TRICHLOROETHANE	6	0	1	6	0	2	6	0	0	5	0	0
1,2 DICHLOROETHANE	6	0	0	6	0	0	6	0	0	5	0	0
CARBON TETRACHLORIDE	6	0	0	6	0	0	6	0	0	5	0	0
1,2 DICHLOROPROPANE	6	0	0	6	0	0	6	0	0	5	0	0
TRICHLOROETHYLENE	6	0	0	6	0	0	6	0	0	5	0	0
DICHLOROBROMOMETHANE	6	0	1	6	6	0	6	6	0	5	5	0
112 TRICHLOROETHANE	6	0	0	6	0	0	6	0	0	5	0	0
CHLORODIBROMOMETHANE	6	0	0	6	6	0	6	6	0	5	5	0
T-CHLOROETHYLENE	6	0	0	6	0	1	6	0	0	5	0	0
BROMOFORM	6	0	0	6	0	6	6	0	5	5	0	4
1122 T-CHLOROETHANE	6	0	0	6	0	0	6	0	0	5	0	0
CHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1,4 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1,3 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
1,2 DICHLOROBENZENE	6	0	0	6	0	0	6	0	0	5	0	0
ETHLYENE DIBROMIDE	6	0	0	6	0	0	6	0	0	5	0	0
TOTL TRIHALOMETHANES	6	0	0	6	6	0	6	6	0	5	5	0
*TOTAL SCAN VOLATILES	174	0	12	174	25	14	174	24	10	145	20	5
*TOTAL GROUP ORGANIC	612	1	17	576	25	21	629	24	17	290	20	7

KEY TO TABLE 5 and 6

A ONTARIO DRINKING WATER OBJECTIVES (ODWO)
1. Maximum Acceptable Concentration (MAC)
1+. MAC for Total Trihalomethanes
2. Interim Maximum Acceptable Concentration (IMAC)
3. Aesthetic Objective (AO)
3*. AO for Total Xylenes
4. Recommended Operational Guideline

B HEALTH & WELFARE CANADA (H&W)
1. Maximum Acceptable Concentration (MAC)
2. Proposed MAC
3. Interim MAC
4. Aesthetic Objective (AO)

C WORLD HEALTH ORGANIZATION (WHO)
1. Guideline Value (GV)
2. Tentative GV
3. Aesthetic GV

D US ENVIRONMENTAL PROTECTION AGENCY (EPA)
1. Maximum Contaminant Level (MCL)
2. Suggested No-Adverse Effect Level (SNAEL)
3. Lifetime Health Advisory
4. EPA Ambient Water Quality Criteria
4T. EPA Ambient Water Quality Criteria for Total PAH

F EUROPEAN ECONOMIC COMMUNITY (EEC)
1. Health Related Guideline Level
2. Aesthetic Guideline Level
3. Maximum Admissable Concentration (MADC)

G CALIFORNIA STATE DEPARTMENT OF HEALTH-GUIDELINE VALUE

I NEW YORK STATE AMBIENT WATER GUIDELINE

N/A NONE AVAILABLE

LABORATORY RESULTS, REMARK DESCRIPTIONS

.	No Sample Taken
BDL	Below Minimum Measurement Amount
<T	Greater Than Detection Limit But Not Confident (SEE INTERPRETATION OF RESULTS ABOVE)
>	Results Are Greater Than The Upper Limit
<=>	Approximate Result
!CS	No Data: Contamination Suspected
!IL	No Data: Sample Incorrectly Labelled
!IS	No Data: Insufficient Sample
!IV	No Data: Inverted Septum
!LA	No Data: Laboratory Accident
!LD	No Data: Test Queued After Sample Discarded
!NA	No Data: No Authorization To Perform Reanalysis
!NP	No Data: No Procedure
!NR	No Data: Sample Not Received
!OP	No Data: Obscured Plate
!QU	No Data: Quality Control Unacceptable
!PE	No Data: Procedural Error - Sample Discarded
!PH	No Data: Sample pH Outside Valid Range
!RE	No Data: Received Empty
!RO	No Data: See Attached Report (no numeric results)
!SM	No Data: Sample Missing
!SS	No Data: Send Separate Sample Properly Preserved
!UI	No Data: Indeterminant Interference
!TX	No Data: Time Expired
A3C	Approximate, Total Count Exceeded 300 Colonies
APL	Additional Peak, Large, Not Priority Pollutant
APS	Additional Peak, Less Than, Not Priority Pollutant
CIC	Possible Contamination, Improper Cap
CRO	Calculated Result Only
PPS	Test Performed On Preserved Sample
RNP	P and M-Xylene Not Separated
RRV	Rerun Verification
RVU	Reported Value Unusual
SPS	Several Peaks, Small, Not Priority Pollutant

UCR		Unreliable: Could Not Confirm By Reanalysis
UCS		Unreliable: Contamination Suspected
UIN		Unreliable: Indeterminate Interference
XP		Positive After X Number Of Hours
T#	(T06)	Result Taken After # Hours

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
BACTERIOLOGICAL				
FECAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 0 (A1)
JAN	BDL	.	.	.
MAR	BDL	.	.	.
MAY	BDL	.	.	.
JUL	BDL	.	.	.
SEP	8	.	.	.
NOV	8	.	.	.
STANDRD PLATE CNT MF (COUNTS/ML)		DET'N LIMIT = 0		GUIDELINE = 500/ML (A3)
JAN	.	14	4 <=>	1 <=>
MAR	.	0 <=>	2 <=>	0 <=>
MAY	.	.	1 <=>	.
JUL	.	18	.	1 <=>
SEP	.	.	0 <=>	.
NOV	.	8 <=>	0 <=>	0 <=>
TOTAL COLIFORM MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = 5/100ML(A1)
JAN	1960	.	.	.
MAR	20 <=>	.	.	.
MAY	BDL	.	.	.
JUL	20 <=>	.	.	.
SEP	80 <=>	.	.	.
NOV	310	.	.	.
T COLIFORM BCKGRD MF (CT/100ML)		DET'N LIMIT = 0		GUIDELINE = N/A
JAN	48000 >	.	.	.
MAR	1730	.	.	.
MAY	7600	.	.	.
JUL	24000 >	.	.	.
SEP	6800	.	.	.
NOV	24000 >	.	.	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
CHEMISTRY (FLD)				
FLD CHLORINE (COMB) (MG/L)			**DET'N LIMIT = 0**	**GUIDELINE = N/A**
JAN	.	.100	.000	.100
MAR	.	.150	.200	.100
MAY	.	.100	.100	.
JUL	.	.100	.000	.100
SEP	.	.200	.100	.100
NOV	.	.100	.100	.150
FLD CHLORINE FREE (MG/L)			**DET'N LIMIT = 0**	**GUIDELINE = N/A**
JAN	.	.900	.900	.900
MAR	.	1.200	.900	.800
MAY	.	.800	.900	.
JUL	.	.900	1.100	.900
SEP	.	.500	.700	.800
NOV	.	.900	.900	.750
FLD CHLORINE (TOTAL) (MG/L)			**DET'N LIMIT = 0**	**GUIDELINE = N/A**
JAN	.	1.000	.900	1.000
MAR	.	1.350	1.100	.900
MAY	.	.900	1.000	.
JUL	.	1.000	1.100	1.000
SEP	.	1.000	.800	.900
NOV	.	1.000	1.000	.900
FLD PH (DMNSLESS)			**DET'N LIMIT = N/A**	**GUIDELINE = 6.5-8.5(A4)**
JAN	7.300	7.400	7.100	7.300
MAR	7.650	7.500	7.200	7.400
MAY	7.800	7.500	7.300	.
JUL	7.930	7.190	7.400	7.400
SEP	8.130	7.500	7.500	7.500
NOV	8.160	7.870	7.400	8.160
FLD TEMPERATURE (DEG.C)			**DET'N LIMIT = N/A**	**GUIDELINE = 15 (A3)**
JAN	1.000	.300	5.000	.300
MAR	3.000	3.400	5.500	11.500
MAY	9.000	10.000	11.500	.
JUL	17.000	17.000	17.000	15.000
SEP	19.000	19.200	23.000	.
NOV	7.000	6.800	9.500	7.000
FLD TURBIDITY (FTU)			**DET'N LIMIT = N/A**	**GUIDELINE = 1 (A1)**
JAN	19.000	.150	.	.150
MAR	2.600	.130	.	.130
MAY	1.400	.140	.	.
JUL	2.500	.130	.	.130
SEP	20.000	.130	.	.130
NOV	41.000	.140	.	.140

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
CHEMISTRY (LAB)				
ALKALINITY (MG/L)			**DET'N LIMIT = 0.2**	**GUIDELINE = 30-500 (A3)**
JAN	89.300	82.100	80.500	79.900
MAR	84.100	75.500	75.800	80.800
MAY	83.000	78.600	76.400	.
JUL	85.400	78.100	75.300	77.800
SEP	83.600	78.100	77.100	79.900
NOV	98.400	94.500	90.800	93.800
CALCIUM (MG/L)			**DET'N LIMIT = 0.2**	**GUIDELINE = 100 (F2)**
JAN	32.200	33.100	33.300	34.100
MAR	27.600	27.200	28.200	28.400
MAY	28.800	30.800	31.000	.
JUL	30.200	30.700	31.500	30.300
SEP	29.600	31.600	30.600	32.600
NOV	33.800	34.600	35.000	34.400
CYANIDE (MG/L)			**DET'N LIMIT = 0.001**	**GUIDELINE = .2 (A1)**
JAN	BDL	BDL	BDL	.
MAR	BDL	BDL	BDL	.
MAY	BDL	.002 <T	BDL	.
JUL	BDL	BDL	BDL	.
SEP	BDL	BDL	BDL	.
NOV	BDL	ISM	BDL	.
CHLORIDE (MG/L)			**DET'N LIMIT = 0.2**	**GUIDELINE = 250 (A3)**
JAN	6.100	7.000	7.100	7.100
MAR	5.900	6.900	7.200	7.600
MAY	5.900	6.700	7.200	.
JUL	5.800	6.800	7.600	7.200
SEP	5.600	7.000	7.600	7.700
NOV	7.000	7.600	8.100	7.700
COLOUR (HZU)			**DET'N LIMIT = 0.5**	**GUIDELINE = 5 (A3)**
JAN	.500 <T	1.000 <T	.500 <T	1.000 <T
MAR	BDL	.500 <T	.500 <T	4.500
MAY	1.000 <T	.500 <T	.500 <T	.
JUL	.500 <T	.500 <T	.500 <T	.500 <T
SEP	1.000 <T	.500 <T	BDL	BDL
NOV	6.500	BDL	BDL	BDL
CONDUCTIVITY (UMHO/CM)			**DET'N LIMIT = 1.**	**GUIDELINE = 400 (F2)**
JAN	225	233	233	236
MAR	216	221	227	233
MAY	215	218	222	.
JUL	220	224	225	223
SEP	215	230	233	237
NOV	249	264	268	262

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
DISS ORG CARBON (MG/L)		**DET'N LIMIT = .100**		**GUIDELINE = 5.0 (A3)**
JAN	1.600	1.400	1.300	1.300
MAR	1.300	1.100	1.100	1.100
MAY	1.500	1.600	1.400	.
JUL	1.600	1.200	2.000	1.200
SEP	1.500	1.400	1.400	1.600
NOV	1.700	1.300	1.300	1.300
FLUORIDE (MG/L)		**DET'N LIMIT = 0.01**		**GUIDELINE = 2.4 (A1)**
JAN	.100	.060	1.020	.060
MAR	.060	.060	1.060	.080
MAY	.100	.080	1.100	.
JUL	.080	.080	1.140	.080
SEP	.080	.080	.680	.080
NOV	.100	.080	.940	.080
HARDNESS (MG/L)		**DET'N LIMIT = 0.5**		**GUIDELINE = 80-100 (A4)**
JAN	113.900	116.000	115.500	117.900
MAR	101.000	100.000	102.000	104.000
MAY	102.000	108.000	111.000	.
JUL	106.400	107.500	109.900	106.100
SEP	106.000	108.900	108.000	112.100
NOV	120.000	121.000	122.000	120.000
IONCAL (DMNSLESS)		**DET'N LIMIT = N/A**		**GUIDELINE = N/A**
JAN	4.219	3.910	5.105	4.422
MAR	14.830	1.922	.224	3.827
MAY	.189	5.352	9.121	.
JUL	1.818	2.357	7.555	1.226
SEP	3.441	3.750	3.714	4.266
NOV	.132	.151	2.341	.175
LANGELIERS INDEX (DMNSLESS)		**DET'N LIMIT = N/A**		**GUIDELINE = N/A**
JAN	.229	.031	-.005	-.009
MAR	.269	.084	.079	.098
MAY	.173	-.053	-.114	.
JUL	.284	.100	-.225	.013
SEP	.188	.121	-.090	.141
NOV	.513	.439	.316	.425
MAGNESIUM (MG/L)		**DET'N LIMIT = 0.10**		**GUIDELINE = 30 (F2)**
JAN	8.100	8.100	7.850	7.950
MAR	7.700	7.700	7.700	8.000
MAY	7.200	7.500	8.100	.
JUL	7.500	7.450	7.600	7.400
SEP	7.700	7.250	7.800	7.450
NOV	8.600	8.300	8.600	8.300

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
SODIUM (MG/L)			**DET'N LIMIT = 0.2**	**GUIDELINE = 200 (A4)**
JAN	3.700	3.600	3.500	3.700
MAR	3.600	3.600	3.600	3.600
MAY	3.400	3.500	3.500	.
JUL	3.600	3.700	4.100	3.400
SEP	3.400	5.200	5.200	5.600
NOV	4.400	5.800	5.800	5.600
AMMONIUM TOTAL (MG/L)			**DET'N LIMIT = 0.002**	**GUIDELINE = 0.05 (F2)**
JAN	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	.116	BDL	.012	.
JUL	.014	.004 <T	BDL	.004 <T
SEP	BDL	BDL	BDL	.004 <T
NOV	.002 <T	BDL	.004 <T	BDL
NITRITE (MG/L)			**DET'N LIMIT = 0.001**	**GUIDELINE = 1 (A1)**
JAN	.004 <T	BDL	BDL	BDL
MAR	.006	BDL	.001 <T	.003 <T
MAY	BDL	.007	.002 <T	.
JUL	.009	.002 <T	.001 <T	.001 <T
SEP	.004 <T	BDL	.001 <T	.002 <T
NOV	.012	BDL	.001 <T	BDL
TOTAL NITRATES (MG/L)			**DET'N LIMIT = 0.005**	**GUIDELINE = 10 (A1)**
JAN	.435	.430	.430	.435
MAR	.395	.395	.500	.620
MAY	.340	.355	.325	.
JUL	.380	.380	.370	.320
SEP	.260	.260	.270	.285
NOV	.635	.640	.650	.620
NITROGEN TOT KJELD (MG/L)			**DET'N LIMIT = 0.02**	**GUIDELINE = N/A**
JAN	.160	.080 <T	.090 <T	.080 <T
MAR	.170	.090 <T	.120	.180
MAY	.460	.130	.090 <T	.
JUL	.290	.110	.230	.100
SEP	.200	.120	.120	.100
NOV	.230	.080 <T	.060 <T	.070 <T
PH (DMNSLESS)			**DET'N LIMIT = N/A**	**GUIDELINE = 6.5-8.5(A4)**
JAN	8.180	8.010	7.980	7.970
MAR	8.310	8.180	8.160	8.150
MAY	8.200	7.970	7.920	.
JUL	8.280	8.130	7.810	8.050
SEP	8.200	8.140	7.950	8.140
NOV	8.410	8.350	8.240	8.340

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
PHOSPHORUS FIL REACT (MG/L)			**DET'N LIMIT = 0.0005**	**GUIDELINE = N/A**
JAN	.006	.000 <T	.004	.
MAR	BDL	BDL	.001 <T	.
MAY	.001 <T	.000 <T	.001 <T	.
JUL	.000 <T	BDL	.025	.
SEP	BDL	.001 <T	BDL	.
NOV	.019	BDL	.002	.
PHOSPHORUS TOTAL (MG/L)			**DET'N LIMIT = 0.002**	**GUIDELINE = .40 (F2)**
JAN	.014	.003 <T	.009 <T	.
MAR	.007 <T	BDL	.004 <T	.
MAY	.024	.004 <T	.004 <T	.
JUL	.007 <T	BDL	.072	.
SEP	.013	BDL	.003 <T	.
NOV	.033	BDL	.002 <T	.
SULPHATE (MG/L)			**DET'N LIMIT = .200**	**GUIDELINE = 500 (A3)**
JAN	16.650	24.590	24.010	27.920
MAR	.500	21.890	21.490	21.270
MAY	15.890	19.370	19.930	.
JUL	16.420	22.680	22.220	22.090
SEP	16.080	25.690	25.650	26.250
NOV	17.810	24.360	26.600	24.040
TURBIDITY (FTU)			**DET'N LIMIT = 0.05**	**GUIDELINE = 1 (A1)**
JAN	17.000	2.400	1.150	.800
MAR	4.100	.250	.400	1.580
MAY	.990	.490	.180	.
JUL	2.400	.200 <T	2.700	.260
SEP	14.000	.290	.220 <T	.350
NOV	43.000	1.200	.560	.390

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
METALS				
ALUMINUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 100 (A4)
JAN	100.000	38.000	32.000	19.000
MAR	40.000	28.000	32.000	40.000
MAY	12.000	110.000	82.000	.
JUL	37.000	120.000	820.000	80.000
SEP	95.000	92.000	100.000	110.000
NOV	190.000	67.000	48.000	60.000
ARSENIC (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 25 (A1)
JAN	.620 <T	.250 <T	.660 <T	.280 <T
MAR	.590 <T	.180 <T	.690 <T	.160 <T
MAY	.530 <T	.370 <T	.520 <T	.
JUL	.410 <T	.200 <T	1.200	.380 <T
SEP	BDL	BDL	.790 <T	.390 <T
NOV	.660 <T	.540 <T	.990 <T	.440 <T
BARIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 1000 (A2)
JAN	17.000	15.000	16.000	16.000
MAR	13.000	13.000	13.000	14.000
MAY	15.000	13.000	13.000	.
JUL	14.000	14.000	15.000	14.000
SEP	16.000	15.000	15.000	15.000
NOV	18.000	16.000	16.000	16.000
BORON (UG/L)			DET'N LIMIT = 2.00	GUIDELINE = 5000 (A1)
JAN	14.000 <T	14.000 <T	14.000 <T	18.000 <T
MAR	24.000	23.000	22.000	27.000
MAY	79.000	31.000	20.000 <T	.
JUL	29.000	27.000	16.000 <T	37.000
SEP	31.000	30.000	22.000	29.000
NOV	14.000 <T	13.000 <T	14.000 <T	13.000 <T
BERYLLIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 6800 (D4)
JAN	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	.060 <T	BDL	BDL	BDL
CADMIUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (A1)
JAN	BDL	BDL	.060 <T	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
COBALT (UG/L)			**DET'N LIMIT = 0.02**	**GUIDELINE = N/A**
JAN	.220 <T	.170 <T	.330 <T	.240 <T
MAR	BDL	BDL	BDL	.240 <T
MAY	.070 <T	.180 <T	.050 <T	.
JUL	.080 <T	.090 <T	.100 <T	.060 <T
SEP	.260 <T	.090 <T	.060 <T	.120 <T
NOV	.350 <T	.120 <T	.120 <T	.070 <T
CHROMIUM (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = 50 (A1)**
JAN	BDL	.820 <T	.970 <T	3.000 <T
MAR	2.800 <T	3.100 <T	2.700 <T	3.400 <T
MAY	3.000 <T	1.600 <T	.880 <T	.
JUL	2.100 <T	1.900 <T	2.000 <T	2.700 <T
SEP	4.000 <T	3.400 <T	2.100 <T	3.400 <T
NOV	1.300 <T	1.200 <T	1.200 <T	.950 <T
COPPER (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = 1000 (A3)**
JAN	1.300 <T	1.600 <T	1.200 <T	1.700 <T
MAR	.970 <T	1.900 <T	1.000 <T	8.700
MAY	1.300 <T	2.200 <T	.830 <T	.
JUL	1.500 <T	1.600 <T	2.100 <T	2.100 <T
SEP	1.400 <T	3.400 <T	.820 <T	1.900 <T
NOV	3.000 <T	2.200 <T	1.900 <T	2.500 <T
IRON (UG/L)			**DET'N LIMIT = 6.00**	**GUIDELINE = 300 (A3)**
JAN	180.000	BDL	BDL	BDL
MAR	48.000 <T	BDL	BDL	78.000
MAY	13.000 <T	BDL	BDL	.
JUL	33.000 <T	BDL	29.000 <T	BDL
SEP	160.000	BDL	BDL	BDL
NOV	300.000	8.200 <T	BDL	BDL
MERCURY (UG/L)			**DET'N LIMIT = 0.02**	**GUIDELINE = 1 (A1)**
JAN	BDL	BDL	.040 <T	.
MAR	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	.
JUL	BDL	.040 <T	BDL	.
SEP	BDL	BDL	.070 <T	.
NOV	BDL	BDL	BDL	.
MANGANESE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 50 (A3)**
JAN	8.100	1.300	.860	.560
MAR	4.400	.580	.510	5.600
MAY	1.400	.840	.250 <T	.
JUL	2.300	.640	2.100	.290 <T
SEP	8.200	2.400	.390 <T	.640
NOV	14.000	3.000	.750	.740

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
MOLYBDENUM (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = N/A
JAN	.450 <T	.560	.560	.800
MAR	.410 <T	.450 <T	.490 <T	.360 <T
MAY	.410 <T	.430 <T	.440 <T	.
JUL	.380 <T	.430 <T	.450 <T	.520
SEP	.410 <T	.640	.540	.560
NOV	.270 <T	.520	.560	.620
NICKEL (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (D3)
JAN	.950 <T	43.000	.770 <T	BDL
MAR	BDL	2.000 <T	BDL	BDL
MAY	.570 <T	4.400	.580 <T	.
JUL	BDL	.400 <T	BDL	BDL
SEP	.240 <T	2.400	1.100 <T	1.200 <T
NOV	1.400 <T	1.200 <T	.290 <T	.660 <T
LEAD (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 10. (A1)
JAN	.310 <T	.740	BDL	.060 <T
MAR	.120 <T	BDL	BDL	.630
MAY	.200 <T	.380 <T	.060 <T	.
JUL	.250 <T	.170 <T	.070 <T	.250 <T
SEP	.380 <T	.550	BDL	.280 <T
NOV	.630	.240 <T	BDL	.350 <T
ANTIMONY (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 146 (D4)
JAN	.370 <T	.410 <T	.500 <T	.530
MAR	.430 <T	.450 <T	.570	.330 <T
MAY	.290 <T	.470 <T	.430 <T	.
JUL	.260 <T	.230 <T	.440 <T	.220 <T
SEP	.450 <T	.500 <T	.460 <T	.480 <T
NOV	.340 <T	.370 <T	.530	.410 <T
SELENIUM (UG/L)			DET'N LIMIT = 1.00	GUIDELINE = 10 (A1)
JAN	BDL	BDL	BDL	BDL
MAR	BDL	BDL	BDL	1.700 <T
MAY	BDL	1.200 <T	1.700 <T	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	1.400 <T	2.100 <T
NOV	BDL	BDL	BDL	BDL
STRONTIUM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = N/A
JAN	120.000	120.000	120.000	130.000
MAR	92.000	90.000	94.000	93.000
MAY	100.000	97.000	96.000	.
JUL	100.000	100.000	110.000	100.000
SEP	120.000	120.000	120.000	120.000
NOV	150.000	150.000	160.000	150.000

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
TITANIUM (UG/L)			**DET'N LIMIT = 0.50**	**GUIDELINE = N/A**
JAN	5.500	3.400 <T	3.500 <T	2.400 <T
MAR	5.000 <T	3.000 <T	4.300 <T	3.700 <T
MAY	5.800	4.500 <T	5.200	.
JUL	7.000	6.400	4.600 <T	6.700
SEP	6.500	4.200 <T	4.500 <T	3.800 <T
NOV	7.700	2.900 <T	3.400 <T	2.900 <T
URANIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 100 (A1)**
JAN	.230 <T	.080 <T	.150 <T	.110 <T
MAR	.170 <T	.060 <T	.100 <T	.160 <T
MAY	.200 <T	.190 <T	.170 <T	.
JUL	.250 <T	.090 <T	.190 <T	.070 <T
SEP	.210 <T	BDL	.080 <T	.100 <T
NOV	.310 <T	.200 <T	.170 <T	.200 <T
VANADIUM (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = N/A**
JAN	.480 <T	1.100	1.000	1.100
MAR	.310 <T	.680	.750	.850
MAY	.180 <T	.420 <T	.490 <T	.
JUL	.290 <T	.630	.720	.610
SEP	.520	.760	.740	.800
NOV	.720	.560	.580	.550
ZINC (UG/L)			**DET'N LIMIT = 0.20**	**GUIDELINE = 5000 (A3)**
JAN	12.000	16.000	1.800 <T	1.300 <T
MAR	2.400	6.400	1.500 <T	2.400
MAY	5.100	14.000	1.500 <T	.
JUL	3.100	6.600	1.800 <T	1.600 <T
SEP	3.400	11.000	1.300 <T	1.800 <T
NOV	8.500	7.800	2.800	2.900

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
PESTICIDES & PCB				
ALPHA BHC (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 700 (G)
JAN	2.000 <T	2.000 <T	1.000 <T	ISM
MAR	2.000 <T	BDL	3.000 <T	1.000 <T
MAY	2.000 <T	1.000 <T	2.000 <T	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	INR	BDL	BDL
NOV	BDL	1.000 <T	2.000 <T	1.000 <T
LINDANE (NG/L)			DET'N LIMIT = 1.000	GUIDELINE = 4000 (A1)
JAN	BDL	BDL	BDL	ISM
MAR	BDL	BDL	BDL	BDL
MAY	BDL	1.000 <T	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	INR	BDL	BDL
NOV	BDL	BDL	BDL	BDL
ATRAZINE (NG/L)			DET'N LIMIT = 50	GUIDELINE = 60000 (A2)
JAN	BDL	BDL	BDL	.
MAR	BDL	BDL	BDL	.
MAY	BDL	BDL	BDL	.
JUL	100.000 <T	110.000 <T	80.000 <T	.
SEP	BDL	BDL	BDL	.
NOV	BDL	BDL	BDL	.
HEXACLCYCLOPENTADIEN (NG/L)			DET'N LIMIT = 5.0	GUIDELINE = 206000 (D4)
NOV	BDL	20.000 <T	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
PHENOLICS (UG/L PHENOLICS)			DET'N LIMIT = .200	GUIDELINE = 2 (A4)
JAN	BDL	BDL	BDL	.
MAR	BDL	BDL	BDL	.
MAY	BDL	BDL	.400 <T	.
JUL	BDL	.600 <T	BDL	.
SEP	.600 <T	BDL	BDL	.
NOV	1.000	BDL	.600 <T	.

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
VOLATILES				
BENZENE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 5 (A1)**
JAN	BDL	BDL	BDL	BDL
MAR	.050 <T	.050 <T	.100 <T	BDL
MAY	.100 <T	BDL	.100 <T	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
TOLUENE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 24 (A3)**
JAN	BDL	2.700	.050 <T	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	.100 <T	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
ETHYLBENZENE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 2.4 (A3)**
JAN	BDL	BDL	BDL	BDL
MAR	.100 <T	.100 <T	.100 <T	.050 <T
MAY	.050 <T	BDL	.050 <T	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	.050 <T	BDL	BDL	BDL
M-XYLENE (UG/L)			**DET'N LIMIT = 0.10**	**GUIDELINE = 300 (A3*)**
JAN	BDL	.200 <T	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
O-XYLENE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 300 (A3*)**
JAN	BDL	.100 <T	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
STYRENE (UG/L)			**DET'N LIMIT = 0.05**	**GUIDELINE = 100 (D1)**
JAN	.050 <T	BDL	BDL	BDL
MAR	.150 <T	BDL	BDL	BDL
MAY	.150 <T	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	.100 <T	BDL	BDL	BDL

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
CHLOROFORM (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	BDL	13.300	17.200	18.600
MAR	BDL	16.200	11.500	19.600
MAY	BDL	12.400	11.700	.
JUL	BDL	13.600	26.300	15.800
SEP	BDL	16.800	18.500	22.300
NOV	.100 <T	15.000	14.700	19.000
111, TRICHLOROETHANE (UG/L)			DET'N LIMIT = 0.02	GUIDELINE = 200 (D1)
JAN	BDL	.180 <T	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	.040 <T	.100 <T	BDL	BDL
DICHLOROBROMOMETHANE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 350 (A1+)
JAN	BDL	8.350	8.600	9.600
MAR	BDL	6.900	6.900	8.550
MAY	BDL	7.250	6.350	.
JUL	BDL	6.750	8.900	7.750
SEP	BDL	8.850	8.650	9.400
NOV	.100 <T	7.950	7.650	8.700
CHLORODIBROMOMETHANE (UG/L)			DET'N LIMIT = 0.10	GUIDELINE = 350 (A1+)
JAN	BDL	3.400	3.000	3.300
MAR	BDL	2.600	2.700	2.900
MAY	BDL	3.400	2.300	.
JUL	BDL	2.600	3.200	2.900
SEP	BDL	4.300	3.500	3.400
NOV	BDL	3.200	2.500	3.000
T-CHLOROETHYLENE (UG/L)			DET'N LIMIT = 0.05	GUIDELINE = 5 (D1)
JAN	BDL	.150 <T	BDL	BDL
MAR	BDL	BDL	BDL	BDL
MAY	BDL	BDL	BDL	.
JUL	BDL	BDL	BDL	BDL
SEP	BDL	BDL	BDL	BDL
NOV	BDL	BDL	BDL	BDL
BROMOFORM (UG/L)			DET'N LIMIT = 0.20	GUIDELINE = 350 (A1+)
JAN	BDL	.400 <T	.200 <T	.200 <T
MAR	BDL	.200 <T	.200 <T	BDL
MAY	BDL	.400 <T	.200 <T	.
JUL	BDL	.200 <T	.400 <T	.200 <T
SEP	BDL	.600 <T	.400 <T	.400 <T
NOV	BDL	.200 <T	BDL	.200 <T

TABLE 5
DRINKING WATER SURVEILLANCE PROGRAM LONDON (LAKE HURON WSS) 1990

	WATER TREATMENT PLANT			DISTRIBUTION SYSTEM
	RAW	TREATED	TREATED 2	SITE 1
				FREE FLOW
TOTL TRIHALOMETHANES (UG/L)		DET'N LIMIT = 0.50		GUIDELINE = 350 (A1)
JAN	BDL	20.300	29.050	31.700
MAR	BDL	25.900	21.300	31.050
MAY	BDL	23.500	20.550	.
JUL	BDL	23.200	38.700	26.750
SEP	BDL	30.500	30.950	35.400
NOV	BDL	26.350	24.800	30.850

TRACE LEVELS OF TOLUENE ARE LABORATORY ARTIFACTS DERIVED FROM THE ANALYTICAL METHODOLOGY.

TRACE LEVELS OF STYRENE ARE CONSIDERED TO BE LABORATORY ARTIFACTS RESULTING FROM THE LABORATORY SHIPPING CONTAINERS.

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE	
BACTERIOLOGICAL				
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	0	(A1)
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	0	500/ML	(A3)
TOTAL COLIFORM BACKGROUND MF	CT/100ML	0	N/A	
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	0	5/100ML	(A1)
CHEMISTRY (FLD)				
FIELD COMBINED CHLORINE RESIDUAL	MG/L	0	N/A	
FIELD TOTAL CHLORINE RESIDUAL	MG/L	0	N/A	
FIELD FREE CHLORINE RESIDUAL	MG/L	0	N/A	
FIELD PH	DMNSLESS	N/A	6.5-8.5	(A3)
FIELD TEMPERATURE	DEG.C	N/A	15.0	(A3)
FIELD TURBIDITY	FTU	N/A	1.0	(A1)
CHEMISTRY (LAB)				
ALKALINITY	MG/L	0.2	30-500	(A3)
AMMONIUM TOTAL	MG/L	0.002	0.05	(F2)
CALCIUM	MG/L	0.2	100	(F2)
CHLORIDE	MG/L	0.2	250	(A3)
COLOUR	TCU	0.5	5.0	(A3)
CONDUCTIVITY	UMHO/CM	1.0	400	(F2)
CYANIDE	MG/L	0.001	0.2	(A1)
DISSOLVED ORGANIC CARBON	MG/L	0.1	5.0	(A3)
FLUORIDE	MG/L	0.01	2.4	(A1)
HARDNESS	MG/L	0.5	80-100	(A4)
LANGELIERS INDEX	DMNSLESS	N/A	N/A	
MAGNESIUM	MG/L	0.1	30.0	(F2)
NITRITE	MG/L	0.001	1.0	(A1)
NITROGEN TOTAL KJELDAHL	MG/L	0.02	N/A	
PH	DMNSLESS	N/A	6.5-8.5	(A4)
PHOSPHORUS FIL REACT	MG/L	0.0005	N/A	
PHOSPHORUS TOTAL	MG/L	0.002	0.4	(F2)
SODIUM	MG/L	0.2	200	(A4)
SULPHATE	MG/L	0.2	500	(A3)
TOTAL NITRATES	MG/L	0.005	10.0	(A1)
TURBIDITY	FTU	0.05	1.0	(A1)
CHLOROAROMATICS				
123 TRICHLOROBENZENE	NG/L	5.0	N/A	
1234 TETRACHLOROBENZENE	NG/L	1.0	N/A	
1235 TETRACHLOROBENZENE	NG/L	1.0	N/A	
124 TRICHLOROBENZENE	NG/L	5.0	10000	(I)
1245-TETRACHLOROBENZENE	NG/L	1.0	38000	(D4)
135 TRICHLOROBENZENE	NG/L	5.0	N/A	
236 TRICHLOROTOLUENE	NG/L	5.0	N/A	
245 TRICHLOROTOLUENE	NG/L	5.0	N/A	
26A TRICHLOROTOLUENE	NG/L	5.0	N/A	
HEXACHLOROBENZENE	NG/L	1.0	10	(C1)
HEXACHLOROBUTADIENE	NG/L	1.0	450	(D4)
HEXACHLOROCYCLOPENTADIENE	NG/L	5.0	206000	(D4)
HEXACHLOROETHANE	NG/L	1.0	1900	(D4)
OCTACHLOROSTYRENE	NG/L	1.0	N/A	
PENTACHLOROBENZENE	NG/L	1.0	74000	(D4)
CHLOROPHENOLS				
234 TRICHLOROPHENOL	NG/L	100.0	N/A	
2345 TETRACHLOROPHENOL	NG/L	20.0	N/A	
2356 TETRACHLOROPHENOL	NG/L	10.0	N/A	

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
245 TRICHLOROPHENOL	NG/L	100.0	2600000 (D4)
246 TRICHLOROPHENOL	NG/L	20.0	5000 (A1)
PENTACHLOROPHENOL	NG/L	10.0	60000 (A1)
METALS			
ALUMINUM	UG/L	0.10	100 (A4)
ANTIMONY	UG/L	0.05	146 (D4)
ARSENIC	UG/L	0.10	25 (A1)
BARIUM	UG/L	0.05	1000 (A2)
BERYLLIUM	UG/L	0.05	6800 (D4)
BORON	UG/L	2.00	5000 (A1)
CADMIUM	UG/L	0.05	5 (A1)
CHROMIUM	UG/L	0.50	50 (A1)
COBALT	UG/L	0.02	N/A
COPPER	UG/L	0.50	1000 (A3)
IRON	UG/L	6.00	300 (A3)
LEAD	UG/L	0.05	10 (A1)
MANGANESE	UG/L	0.05	50 (A3)
MERCURY	UG/L	0.02	1 (A1)
MOLYBDENUM	UG/L	0.05	N/A
NICKEL	UG/L	0.20	350 (D3)
SELENIUM	UG/L	1.00	10 (A1)
SILVER	UG/L	0.05	50 (A1)
STRONTIUM	UG/L	0.10	N/A
THALLIUM	UG/L	0.05	13 (D4)
TITANIUM	UG/L	0.50	N/A
URANIUM	UG/L	0.05	100 (A1)
VANADIUM	UG/L	0.05	N/A
ZINC	UG/L	0.20	5000 (A3)
PAH			
ANTHRACENE	NG/L	1.0	N/A
BENZO(A) ANTHRACENE	NG/L	20.0	N/A
BENZO(A) PYRENE	NG/L	5.0	10.0 (A1)
BENZO(B) CHRYSENE	NG/L	2.0	N/A
BENZO(B) FLUORANTHENE	NG/L	10.0	N/A
BENZO(E) PYRENE	NG/L	50.0	N/A
BENZO(G,H,I) PERYLENE	NG/L	20.0	N/A
BENZO(K) FLUORANTHENE	NG/L	1.0	N/A
CHRYSENE	NG/L	50.0	N/A
CORONENE	NG/L	10.0	N/A
DIBENZO(A,H) ANTHRACENE	NG/L	10.0	N/A
DIMETHYL BENZO(A) ANTHRACENE	NG/L	5.0	N/A
FLUORANTHENE	NG/L	20.0	42000.0 (D4)
INDENO(1,2,3-C,D) PYRENE	NG/L	20.0	N/A
PERYLENE	NG/L	10.0	N/A
PHENANTHRENE	NG/L	10.0	N/A
PYRENE	NG/L	20.0	N/A
PESTICIDES & PCB			
ALACHLOR (LASSO)	NG/L	500.0	5000 (A2)
ALDRIN	NG/L	1.0	700 (A1)
ALPHA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	700 (G)
ALPHA CHLORDANE	NG/L	2.0	7000 (A1)
AMETRINE	NG/L	50.0	300000 (D3)
ATRATONE	NG/L	50.0	N/A
ATRAZINE	NG/L	50.0	60000 (A2)
DES ETHYL ATRAZINE	NG/L	200.0	60000 (A2)
BETA HEXACHLOROCYCLOHEXANE (BHC)	NG/L	1.0	300 (G)
CYANAZINE (BLADEX)	NG/L	100.0	10000 (A2)
O,P-DDD	NG/L	5.0	10 (I)
DIELDRIN	NG/L	2.0	700 (A1)
ENDOSULFAN 1 (THIODAN I)	NG/L	2.0	74000 (D4)
ENDOSULFAN 2 (THIODAN II)	NG/L	5.0	74000 (D4)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
ENDOSULFAN SULPHATE (THIODAN SULPHATE)	NG/L	5.0	N/A
ENDRIN	NG/L	5.0	1600 (D3)
GAMMA CHLORDANE	NG/L	2.0	7000 (A1)
HEPTACHLOR	NG/L	1.0	3000 (A1)
HEPTACHLOR EPOXIDE	NG/L	1.0	3000 (A1)
LINDANE (GAMMA BHC)	NG/L	1.0	4000 (A1)
METHOXYCHLOR	NG/L	5.0	900000 (A1)
METOLACHLOR	NG/L	500.0	50000 (A2)
METRIBUZIN (SENCOR)	NG/L	100.0	80000 (A1)
MIREX	NG/L	5.0	N/A
P,P-DDD	NG/L	5.0	N/A
O,P-DDT	NG/L	5.0	30000 (A1)
OXYCHLORDANE	NG/L	2.0	N/A
PCB	NG/L	20.0	3000 (A2)
PPDDE	NG/L	1.0	30000 (A1)
PPDDT	NG/L	5.0	30000 (A1)
PROMETONE	NG/L	50.0	52500 (D3)
PROMETRYNE	NG/L	50.0	1000 (A2)
PROPAZINE	NG/L	50.0	700000 (D3)
SIMAZINE	NG/L	50.0	10000 (A2)
D-ETHYL SIMAZINE	NG/L	200.0	10000 (A2)
TOXAPHENE	NG/L	500.0	5000 (A1)
PHENOLICS			
PHENOLICS (UNFILTERED REACTIVE)	UG/L	0.2	2 (A4)
SPECIFIC PESTICIDES			
2,4 D PROPIONIC ACID	NG/L	100.	N/A
2,4,5-TRICHLOROPHENOXY ACETIC ACID	NG/L	50.	280000 (A1)
2,4-DICHLOROBUTYRIC ACID (2,4-D)	NG/L	100.	100000 (A1)
24-DICHLORORPHENOXYBUTYRIC ACID (24-DB)	NG/L	200.	18000 (B3)
BUTYLATE (SUTAN)	NG/L	2000.	245000 (D3)
CARBARYL (SEVIN)	NG/L	200.	90000 (A1)
CARBOFURAN	NG/L	2000.	90000 (A1)
CHLORPYRIFOS (DURSBAN)	NG/L	20.	N/A
CICP (CHLORPROPHAM)	NG/L	2000.	350000 (G)
DIALLATE	NG/L	2000.	N/A
DIAZINON	NG/L	20.	20000 (A1)
DICAMBA	NG/L	50.	120000 (A1)
DICHLOROVOS	NG/L	20.	N/A
EPTAM	NG/L	2000.	N/A
ETHION	NG/L	20.	35000 (G)
IPC	NG/L	2000.	N/A
MALATHION	NG/L	20.	190000 (A1)
METHYL PARATHION	NG/L	50.	7000 (B3)
METHYLTRITHION	NG/L	20.	N/A
MEVINPHOS	NG/L	20.	N/A
PARATHION	NG/L	20.	50000 (A1)
PHORATE (THIMET)	NG/L	20.	2000 (A2)
PROPOXUR (BAYGON)	NG/L	2000.	140000 (D3)
RELDAN	NG/L	20.	N/A
RONNEL	NG/L	20.	N/A
SILVEX (2,4,5-TP)	NG/L	20.	10000 (A1)
VOLATILES			
1,1 DICHLOROETHANE	UG/L	0.10	N/A
1,1 DICHLOROETHYLENE	UG/L	0.10	7 (D1)
1,2 DICHLOROBENZENE	UG/L	0.05	200 (A1)
1,2 DICHLOROETHANE	UG/L	0.05	5 (A1)

TABLE 6
DRINKING WATER SURVEILLANCE PROGRAM 1990

SCAN/PARAMETER	UNIT	DETECTION LIMIT	GUIDELINE
1,2 DICHLOROPROPANE	UG/L	0.05	5 (D1)
1,3 DICHLOROBENZENE	UG/L	0.10	3750 (D3)
1,4 DICHLOROBENZENE	UG/L	0.10	5 (A1)
111, TRICHLOROETHANE	UG/L	0.02	200 (D1)
112 TRICHLOROETHANE	UG/L	0.05	0.6 (D4)
1122 TETRACHLOROETHANE	UG/L	0.05	0.17(D4)
BENZENE	UG/L	0.05	5 (A1)
BROMOFORM	UG/L	0.20	350 (A1+)
CARBON TETRACHLORIDE	UG/L	0.20	5 (A1)
CHLOROBENZENE	UG/L	0.10	1510 (D3)
CHLORODIBROMOMETHANE	UG/L	0.10	350 (A1+)
CHLOROFORM	UG/L	0.10	350 (A1+)
DICHLOROBROMOMETHANE	UG/L	0.05	350 (A1+)
ETHLYENE DIBROMIDE	UG/L	0.05	50 (D1)
ETHYLBENZENE	UG/L	0.05	2.4 (A3)
M-XYLENE	UG/L	0.10	300 (A3*)
METHYLENE CHLORIDE	UG/L	0.50	50 (A1)
O-XYLENE	UG/L	0.05	300 (A3*)
P-XYLENE	UG/L	0.10	300 (A3*)
STYRENE	UG/L	0.05	100 (D1)
TETRACHLOROETHYLENE	UG/L	0.05	5 (D1)
TRANS 1,2 DICHLOROETHYLENE	UG/L	0.10	70 (D1)
TOLUENE	UG/L	0.05	24 (A3)
TOTAL TRIHALOMETHANES	UG/L	0.50	350 (A1)
TRICHLOROETHYLENE	UG/L	0.10	50 (A1)

Appendix A

DRINKING WATER SURVEILLANCE PROGRAM
PROGRAM DESCRIPTION

The Drinking Water Surveillance Program (DWSP) for Ontario monitors drinking water quality at municipal water supply systems. The DWSP Database Management System provides a computerized drinking water quality information system for the supplies monitored. The objectives of the program are to provide:

- immediate, reliable, current information on drinking water quality;
- a flagging mechanism for guideline exceedance;
- a definition of contaminant levels and trends;
- a comprehensive background for remedial action;
- a framework for assessment of new contaminants; and
- an indication of treatment efficiency of plant processes.

PROGRAM

The DWSP officially began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. In 1990, 76 systems were being monitored. Water supply locations have been prioritized for surveillance based primarily on criteria such as population density, probability of contamination and geographical location.

An ongoing assessment of future monitoring requirements at each location will be made. Monitoring will continue at the initial locations at an appropriate level and further locations will be phased into the program as resources permit.

A major goal of the program is to collect valid water quality data in context with plant operational characteristics at the time of sampling. As soon as sufficient data have been accumulated and analyzed, both the frequency of sampling and the range of parameters may be adjusted accordingly.

Assessments are carried out at all locations prior to initial sampling, in order to acquire complete plant process and distribution system details and to designate (and retrofit if necessary) all sampling systems and locations. This ensures that the sampled water is a reflection of the water itself.

Samples are taken of raw (ambient water) and treated water at the treatment plant and of consumer's tap water in the distribution system. In order to determine possible effects of distribution on water quality, both standing and free flow water in old and new sections of the distribution system are sampled. Sampling is carried out by operational personnel who have been trained in applicable procedures.

Comprehensive standardized procedures and field test kits are supplied to sampling personnel. This ensures that samples are taken and handled according to standard protocols and that field testing will supply reliable data. All field and laboratory analyses are carried out using "approved documented procedures". Most laboratory analyses are carried out by the Ministry of Environment (MOE), Laboratory Services Branch. Radionuclides are analyzed by the Ministry of Labour.

DATA REPORTING MECHANISM

When the analytical results are transferred from the MOE laboratory into the DWSP system, printouts of the completed analyses are sent to the MOE District Officer, the appropriate operational staff and are also retained by the DWSP unit.

PROGRAM INPUTS AND OUTPUTS

There are four major inputs and four major outputs in the program.

Program Input - Plant and Distribution System Description

The system description includes plant specific non-analytical information acquired through a questionnaire and an initial plant visit. During the initial assessment of the plant and distribution system, questionnaire content is verified and missing information added. It is intended that all data be kept current with scheduled annual updates.

The Plant and Distribution System Description consists of the following seven components:

1. PROCESS COMPONENT INVENTORY

All physical and chemical processes to which the water is subjected, from the intake pipe to the consumers' tap (where possible), are documented. These include: process type, general description of physical structures, material types, sizes, and retention time for each process within the plant. The processes may be as simple as transmission or as complex as carbon adsorption.

2. TREATMENT CHEMICALS

Chemicals used in the treatment processes, their function, application point, supplier and brand-name are recorded. Chemical dosages applied on the day of sampling are recorded in DWSP.

3. PROCESS CONTROL MEASUREMENTS

Documentation of in-plant monitoring of process parameters (eg. turbidity, chlorine residuals, pH, aluminum residuals) including methods used, monitoring locations and frequency is contained in this section. Except for the recorded Field Data, in-plant monitoring results are not retained in DWSP but are retained by the water treatment plant personnel.

4. DESIGN FLOW AND RETENTION TIME

Hydraulic capacity, designed and actual, is noted here. Retention time (the time that a block of water is retained in the plant) is also noted. Maximum, minimum and average flow, as well as a record of the flow rate on the day of sampling, are recorded in DWSP.

5. DISTRIBUTION SYSTEM DESCRIPTION

This area includes the storage and transmission characteristics of the distribution system after the water leaves the plant.

6. SAMPLING SYSTEM

Each plant is assessed for its adequacy in terms of the sampling of bacteriological, organic and inorganic parameters. Prime considerations in the assessment and design of the sampling system are:

i/ the sample is an accurate representation of the actual water condition, eg. raw water has had no chemical treatment;

ii/ the water being sampled is not being modified by the sampling system;

iii/ the sample tap must be in a clean area of the plant, preferably a lab area; and

iv/ the sample lines must be organically inert (no plastic, ideally stainless steel).

It is imperative that the sampled water be a reflection not of the sampling system but of the water itself.

The sampling system documentation includes: origin of the water; date sampling was initiated; size, length and material type (intake,

discharge and tap); pump characteristics (model, type, capacity); and flow rate.

7. PERSONNEL

This section contains the names, addresses and phone numbers of current plant management and operational staff, distribution system management and operational staff, Medical Officer of Health and appropriate MOE personnel associated with the plant.

Program Input - Field Data

The second major input to DWSP is field data. Field data is collected at the plant and from the distribution system sites on the day of sampling. Field data consists of general operating conditions and the results of testing for field parameters. General operating conditions include chemicals used, dosages, flow and retention time on the day of sampling, as well as, monthly maximum, minimum and average flows. Field parameters include turbidity, chlorine residuals (free, combined and total), temperature and pH. These parameters are analyzed according to standardized DWSP protocols to allow for interplant comparison.

Program Input - Laboratory Analytical Data

The third major input to DWSP is Laboratory Analytical Data. Samples gathered from the raw, treated and distribution sampling sites are analyzed for the presence of approximately 180 parameters at a frequency of two to twelve times per year. Sixty-five percent of the parameters are organic. Parameters measured may have health or aesthetic implications when present in drinking water. Many of the parameters may be used in the treatment process or may be treatment by-products. Due to the nature of certain analytical instruments, parameters may be measured in a "scan" producing some results for parameters that are not on the DWSP priority list, but which may be of interest. The majority of parameters are measured on a routine basis. Those that are technically more difficult and/or costly to analyze, however, are done less frequently. These include Specific Pesticides and Chlorophenols.

Although the parameter list is extensive, additional parameters with the potential to cause health or aesthetic related problems may be added provided reliable analytical and sampling methods exist.

All laboratory generated data is derived from standardized, documented analytical protocols. The analytical method is an integral part of the data and as methods change, notation will be made and comparison data documented.

Program Input - Parameter Reference Information

The fourth major input to DWSP is Parameter Reference Information. This is a catalogue of information for each substance analyzed on DWSP. It includes parameter name and aliases, physical and chemical properties, basic toxicology, world-wide health limits, treatment methods and uses. The Parameter Reference Information is computerized and can be accessed through the Query function of the DWSP database. An example is shown in figure 1.

Program output - Query

All DWSP information is easily accessed through the Query function, therefore, anything from addresses of plant personnel to complete water quality information for a plant's water supply is instantly available. The DWSP computer system makes relatively complex inquiries manageable. A personal password allowing access into the DWSP query mode in all MOE offices is being developed by the DWSP group.

Program Output - Action Alerts

Drinking Water quality in Ontario is evaluated against provincial objectives as outlined in the Ontario Drinking Water Objectives publication. Should the reported level of a substance in treated water exceed the Ontario Drinking Water Objective, an "Action Alert" requiring resampling and confirmation is issued. This assures that operational staff, health authorities and the public are notified as soon as possible of the confirmation of an exceedance and remedial action taken. This report supplies a history of the occurrence of past exceedances at the plant plus a historical summary on the parameter of concern.

In the absence of Ontario Drinking Water Objectives, guidelines/limits from other agencies are used. The Parameter Listing System, published by MOE (ISBN 0-7729-4461-X), catalogues and keeps current guidelines for 650 parameters from agencies throughout the world. If these guidelines are exceeded, the results are flagged and evaluated by DWSP personnel. An "Action Alert" will be issued if warranted.

Program Output - Report Generation

Custom reports can be generated from DWSP to meet MOE Regional needs and to respond to public requests.

Program Output - Annual Reports

It is the practice of DWSP to produce an annual report containing analytical data along with companion plant information.

FIG.1

MOE - DRINKING WATER ASSESSMENT PROGRAM (DWSP)

PARAMETER REFERENCE INFORMATION

BENZENE (B2001P) VOLATILES

CLASS: HEALTH METHOD: POCODO UNIT: µg/L

SOURCE	FROM	TO	METHOD	GUIDELINE	UNIT	NOTE
CAL C	85/01			0.700	µg/L	AL
CDWG C	87/01			5.000	µg/L	MAC
EPA C	87/07			5.000	µg/L	MCL
EPAA C	80/11			6.600	µg/L	AMBIENT **
FERC C	84/05			1.000	µg/L	MCL
WHO C	84/01			10.000	µg/L	GV

DESCRIPTION:**NAME:** BENZENE
CAS#: 71-43-2
MOLECULAR FORMULAE: C_6H_6
DETECTION LIMIT: (FOR METHOD POCODO) 0.05 µg/L
SYNONYMS: BENZOL; BENZOLE; COAL NAPHTHA; CARBON OIL (27). CYCLOHEXATRIENE (41).
CHARACTERISTICS: COLOURLESS TO LIGHT-YELLOW, MOBILE, NON-POLAR LIQUID, OF HIGHLY REFRACTIVE NATURE, AROMATIC ODOUR; VAPOURS BURN WITH SMOKING FLAME (30).
PROPERTIES: SOLUBILITY IN WATER: 1780-1800 mg/L AT 25C (41). THRES OLD ODOUR: 0.5 - 10 PPM IN WATERTHRESHOLD TASTE: 0.5 mg/L IN WATER (39).
ENVIRONMENTAL FATE: MAY BIOACCUMULATE IN LIVING ORGANISMS AND APPEARS TO ACCUMULATE IN ANIMAL TISSUES THAT EXHIBIT A HIGH LIPID CONTENT OR REPRESENT MAJOR METABOLIC SITES, SUCH AS LIVER OR BRAIN; SMALL QUANTITIES EVAPORATE FROM SOILS OR ARE DEGRADED RATHER QUICKLY (80).
SOURCES: COMMERCIAL: PETROLEUM REFINING; SOLVENT RECOVERY; COAL TAR DISTILLATION (39); FOOD PROCESSING AND TANNING INDUSTRIES; COMBUSTION OF CAR EXHAUST.
ENVIRONMENTAL: POSSIBLE SOURCE IS RUNOFF.
USES: DETERGENTS; NYLON; INTERMEDIATE IN PRODUCTION OF

OTHER COMPOUNDS, SUCH AS PESTICIDES; SOLVENT FOR EXTRACTION AND RECTIFICATION IN RUBBER INDUSTRY; DEGREASING AND CLEANSING AGENT; GASOLINE.

TOXICITY: RATING: 4 (VERY TOXIC).
ACUTE: IRRITATING TO MUCOUS MEMBRANES; SYMPTOMS INCLUDE RESTLESSNESS, CONVULSIONS, EXCITEMENT, DEPRESSION; DEATH MAY FOLLOW RESPIRATORY FAILURE.
CHRONIC: MAY CAUSE ANAEMIA AND LEUKAEMIA (45); MUTAGENIC.
MODE OF ACTION: CHROMOABERRATION IN LYMPHOCYTE CULTURES.

CARCINOGENICITY: A KNOWN HUMAN CARCINOGEN.

REMOVAL: THE FOLLOWING PROCESSES HAVE BEEN SUCCESSFUL IN REMOVING BENZENE FROM WASTEWATER: GAC ADSORPTION, PRECIPITATION WITH ALUM AND SUBSEQUENT REMOVAL VIA SEDIMENTATION, COAGULATION AND FLOCCULATION, SOLVENT EXTRACTION, OXIDATION

ADDITIONAL PROPERTIES:
MOLECULAR WEIGHT: 78.12
MELTING POINT: 5.5°C (27).
BOILING POINT: 80.1°C (27).
SPECIFIC GRAVITY: 0.8790 AT 20°C (27).
VAPOUR PRESSURE: 100 MM AT 26.1°C (27).
HENRY'S LAW CONSTANT: 0.00555 ATM-M3/MOLE (41).
LOG OCT./WATER PARTITION COEFFICIENT: 1.95 TO 2.13 (39).
CARBON ADSORPTION: K=1.0; 1/N=1.6; R=0.97; PH=5.3 (41)SEDIMENT/WATER PARTITION COEFFICIENT: NO DATA

NOTES: EPA PRIORITY POLLUTANT.

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)

Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top

Appendix B

DWSP SAMPLING GUIDELINE

i) Raw and Treated at Plant

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-220 mL plastic bottle with white seal on cap -do not rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)
Volatiles (duplicates) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do not rinse bottle -fill bottle completely without bubbles
Organics (OWOC),(OWTRI),(OAPAHX)	-1 L amber glass bottle per scan -do not rinse bottle -fill to 2 cm from top -when 'special pesticides' are requested three extra bottles must be filled
Cyanide	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops sodium hydroxide (NaOH) (**Caution:** NaOH is corrosive)

Mercury	-250 mL glass bottle -rinse bottle and cap three times -fill to top of label -add 20 drops each nitric acid (HNO_3) and potassium dichromate ($K_2Cr_2O_7$) (**Caution:** HNO_3&$K_2Cr_2O_7$ are corrosive)
Phenols	-250 mL glass bottle -do <u>not</u> rinse bottle, preservative has been added -fill to top of label
Radionuclides (as scheduled)	-4 L plastic jug -do <u>not</u> rinse, carrier added -fill to 5 cm from top
Organic Characterization (GC/MS - once per year)	-1 L amber glass bottle; instructions as per organic -250 mL glass bottle -do <u>not</u> rinse bottle -fill completely without bubbles

<u>Steps:</u>

1. Let sampling water tap run for an adequate time to clear the sample line.

2. Record time of day on submission sheet.

3. Record temperature on submission sheet.

4. Fill up all bottles as per instructions.

5. Record chlorine residuals (free, combined and total for treated water only), turbidity and pH on submission sheet.

ii) Distribution Samples (standing water)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top

Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid (HNO_3) (**Caution:** HNO_3 is corrosive)

Steps:

1. Record time of day on submission sheet.
2. Place bucket under tap and open cold water.
3. Fill to predetermined volume.
4. After mixing the water, record the temperature on the submission sheet.
5. Fill general chemistry and metals bottles.
6. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.

iii) Distribution Samples (free flow)

General Chemistry	-500 mL plastic bottle (PET 500) -rinse bottle and cap with sample water three times -fill to 2 cm from top
Bacteriological	-250 mL plastic bottle with white seal on cap -do <u>not</u> rinse bottle, preservative has been added -avoid touching bottle neck or inside of cap -fill to top of red label as marked
Metals	-500 mL plastic bottle (PET 500) -rinse bottle and cap three times -fill to 2 cm from top -add 10 drops nitric acid HNO_3 (**Caution:** HNO_3 is corrosive)

Volatiles (duplicate) (OPOPUP)	-45 mL glass vial with septum (teflon side must be in contact with sample) -do <u>not</u> rinse bottle, preservative has been added -fill bottle completely without bubbles
Organics (OWOC) (OAPAHX)	-1 L amber glass bottle per scan -do <u>not</u> rinse bottle -fill to 2 cm from top

<u>Steps:</u>

1. Record time of day on submission sheet.

2. Let cold water flow for five minutes.

3. Record temperature on submission sheet.

4. Fill all bottles as per instructions.

5. Record chlorine residuals (free, combined and total), turbidity and pH on submission sheet.